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A
Preliminary Diſcourſe
To A
SCHEME,
Demonſtrating and Shewing
THE
Perfection and *Harmony*
OF
SOUNDS.

By WILLIAM JACKSON, *M.M.*

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TO EDWARD BARKER
# of the *Inner-Temple*,
London, Eſq;

SIR,

THIS *SCHEME*, together with theſe Papers, are humbly addreſs'd to You, as their *Patron*; which, in all Probability, had late, or never ſeen the Light, but for the Encouragement You were pleaſed to beſtow on their Author, in the Proſecution of this WORK: If, herein, I have done any Service to the Publick, I am aſſured it will be a Satisfaction to You; who, as You find a peculiar Delight in

“ *act Diſquiſition: For we deſire that all Men*
“ *ſhould learn, and perceive how ſevere a*
“ *Thing the true Inquiſition of Nature is,*
“ *and ſhould accuſtom themſelves by the Light*
“ *of Particulars, to enlarge their Mind to*
“ *the Amplitude of the World, and not reduce*
“ *the World to the Narrowneſs of their*
“ *Minds. This Reflection of his Lordſhip, is ſufficient to ſhew the Difficulties that attend, and the Pains that muſt be taken, by that Perſon, who would explore the Truth of this Doctrine.*

However, let Sound *be what it will in itſelf, this is certain, That by a local Motion of the Air,* Sound *is conveyed to, and makes an Impreſſion on the auditory* Nerve; *which is ſufficient for my Purpoſe, my Conſideration of it commencing only from the Time of it's being received by the Ear.*

Sounds *are diſtinguiſh'd into harmonical and inharmonical: Inharmonical we wave, as being foreign to our Purpoſe; and proceed to Harmonical, commonly known and diſtinguiſhed by the Name of* Tones.

Tones, *being the conſtituent Parts of* Muſick, *leads us to the Definition of* Muſick *itſelf. Now* Mu-

Muſick *is a harmonical Diſpoſition of* Tones:

And my Opinion is, That there may be Perfection in Muſick ; i. e. *That Perfection may be produced from a Power or eſſential Quality in all muſical* Tones, *provided they be properly aſſigned, applyed, or conjoined, one with, or to the other: This Doctrine I ground on the manifold Experience I have had of it, through the whole Courſe of my many Years Inquiſition; and indeed is the* materia prima, *as I may call it, of the Syſtem, and the Baſis on which I build the whole* Scheme.

I think fit to premiſe, That in the whole Courſe of this my Diſquiſition, having never conſulted either Books or Perſons, and thereby kept myſelf unprejudiced; I had the greater Advantage in my Inveſtigation of the Truth, which at length attained no other Ways, but by a continual Series of Experiments, and repeated Trials, which never once deceived me, but always confirmed the Doctrines advanced in the Scheme: *So that not having preposterouſly drawn the Truth out of Rules, but applied proper Rules to the Truth firſt found; I have advanced nothing in this* Scheme, *but what I am able, and ſhall be willing at any Time, to demonſtrate to any Perſon of a competent Ear or Judgment: All this is well known to ſeveral of the moſt eminent Profeſſors of* Muſick *in* London, *who have ſeen the Proof of theſe Things, and with whoſe entire Approbation of the Premiſſes, I have been honoured; and being ſenſible of the various Opinions and different Judgments of the World as to the Subject in Hand, I have carefully avoided all Repreſentations of, or Reflections on any other Sentiments or Productions of this Nature; being reſolved to ſtand or fall by my own Principles, and if Truth is on my Side, it muſt, and will prevail; if not, I ſhall reap my Labour for my Pains, and reſt ſatisfied with my Endeavours, to promote the Improvement of a Science univerſally beloved and eſteemed: The Uſe of which, I with due Reſpect, recommend and ſubmit to the Maſters of muſical Compoſitions; whoſe Works have already raiſed their Reputation in the polite World, and given good Earneſt of an Increaſe of Fame, by the Merit of their future Performances.*

A

A Preliminary
DISCOURSE
To a SCHEME, Demonſtrating the Perfection and Harmony of SOUNDS.

THE *SCHEME* is divided into eighteen Columns, each Column known by the Numbers, 1, 2, 3, 4, *&c.* placed over their reſpective Heads.

Col. I.

The *Firſt* Column conſiſts of *Sound*; and the Notes with their Names, which ſignify the Parts of *Sound*.

The firſt principal Thing here to be conſider'd, is *Sound*; whether produc'd by a Voice, Pipe or String, *&c.* and is here repreſented by the firſt double Line Letter C, which *Sound* is the principal Medium between all Intervals.

The ſecond double Line repreſents *Sound* alſo, which is to be conſider'd as an Uniſon: For two equal Bodies of *Sound*, not being deviſible, ever produce one and the ſame *Sound*.

Theſe two double Lines repreſenting *Sound*, may be ſuppoſed two muſical Strings, in Union one with the other, ſtrained to the Pitch of a clear *Sound*, and divided into Muſical Intervals by the Lines drawn croſſwiſe through this and the reſt of the Columns.

The Proportions of the Vibrations of each Muſical Interval, ſuppoſed to be ſtopped on one String, compared to the whole *Sound* of the other String, are expreſſed in the ſecond Column adjoining to the Notes, with their Names on the Right Hand; and are to be compared together thus: If the proportion of an Octave or half of the whole *Sound* be as 1 to 2 then are its Vibrations, in relation to the whole *Sound* as 2 is to 1. If the Proportion of a perfect fourth be as 3 to 4, then are its Vibrations as 4 to 3. If a greater ſixth be as 3 to 5, then will the Vibrations be as 5 to 3; and ſo on *cæteris paribus*, ſo that the Quickneſs of Vibration, and conſequently the Pulſation of the Air, runs always in Poportion to the Length of the String.

It is further to be obſerv'd, that each Note ſhould expreſs a diſtinct *Sound* at ſome certain Pitch, or at ſuch a determinate Degree of *Gravity* or *Acuteneſs*; or, as it is now called *Flatneſs* or *Sharpneſs*; and the Relative or Comparative Conſideration of two or more ſuch Sounds, or Degrees of Flatneſs or Sharpneſs is the Ground of what we call *Concord* or *Diſcord*; that is, a ſoft or harſh Coincidence.

What has been here mentioned of Proportions will more plainly appear by an Examination of the *Third* Column, to which we proceed.

Col. III.

See Column the *Third*; in which are contained the Numbers which expreſs the Proportions of every Interval of Muſical *Sound*, agreeing with the Proportions of Numbers.

Theſe Proportions are proved by dividing the double Line, ſuppoſed to be *Sound*, into ſo many equal Parts, as the greater Number of the two expreſſes, which is aſſigned to that Interval you would examine: Then take the leſſer Number of Parts, and compare them together thus: As the leſſer Number of Parts is to the greater Number of Parts, or the whole *Sound*; ſo is the Proportion of this Interval.

N. B. Compute the leſſer Number of Parts from the upper end of the double Line;—— —— for example, (by which you may conceive the reſt) In this Column you will find the Numbers aſſign'd to the Proportion of an Octave to be 1 to 2: 2 being the greater Number, divide the double Line, ſuppoſed to be the whole *Sound*, into 2 equal Parts (if you try the Diviſion with Compaſſes or Dividers, you will find it will come true) then compare the leſſer Number 1 with the whole Length, and it will give the Half of the whole *Sound*; that is 1 to 2, the Proportion of an Octave:

Again, 2 to 3, is aſſigned to the Proportion of a perfect Fifth: Divide the double Line into 3 equal Parts, 3 being the greater Number, then compute the leſſer Number 2, and compare it with the greater, 3, being the whole *Sound*; and it gives the Proportion of a perfect Fifth, *i. e.* 2 to 3.

Further, 4 to 5 is aſſigned to the Proportion of a greater third: 5 being the greater Number, divide the double Line into 5 equal Parts, then compute 4 of thoſe Parts, being the leſſer Number, and ſuppoſed to be the Acuter or Sharper *Sound*; and compare them with the Graver or Flatter *Sound*, which was at 5 equal Parts or the whole *Sound*, and you will find it to be one part leſs in 5 of the Graver or the whole *Sound*: Therefore it is ſaid that the Proportion of a greater third is as 4 to 5. In like manner may all the other Proportions be proved.

A more conciſe manner is by dividing on the croſs Lines in this Column, by means of the Diagonal Line, drawn from the Point of the double Line above, to the Point of the ſingle Line below: for that Line cuts off ſo many Parts, by which the Acuter or Sharper *Sound* is leſs than the Graver or Flatter *Sound*.

The Line juſt mention'd repreſents a Diagonal Scale, in which is ſhewn the true Gradation of *Sound* through all Diapaſons, real or imaginary.

And here I think it requiſite to ſpeak a Word or two concerning the Uſe and Excellency of the principal Doctrin in this Scheme, *viz.* the true and exact Diminution of *Sound* paſſing through all Octaves or Diapaſons *ad infinitum*: For all Bodies of *Sound*, from the ſmalleſt to the greateſt, diminiſh, (as they ariſe through all Octaves) according to the Rules of Proportion here laid down. For, taking your Medium from the Line of Contingency at the bottom of the firſt Octave, and carrying one Particle of *Sound* into the ſecond, *Sound* in Quantity is reduced and brought exactly to the Half, and ſo it proceeds diminiſhing by the Half through all Octaves or Diapaſons *ad infinitum*.

This is the Doctrine which accounts for the Aſſignments of the Proportions of all Intervals; and this it is which gives the Reaſon why all Muſical Tones of the ſame Denomination and Quality, aſcending or deſcending, or any Body of the *Sound* divided in the middle; the one of neceſſity will be more Grave, the other more Acute. For, although Tones of the ſame denomination retain the ſame Quality; yet they alter in their Quantity, aſcending or deſcending, larger by deſcent, ſmaller by aſcent as ſhall be proved hereafter, when I come to ſpeak of the Particles, or ſmalleſt Bodies of *Sound*, of which all greater Bodies are compounded; where alſo ſhall be ſhewn of what Quantity the Diminution of all Bodies of *Sound* Muſical conſiſts.

But to return, I cannot but think that if this grand Arcanum of *Sounds* Muſical had been elucidated in former Ages, Muſick as to the Theory, had long ago been near its Perfection. There is nothing now extant of the Ancients (that I know or can hear of) which proves they had any Conception of this Doctrine, but rather to the contrary: For, in the Diſtribution of their Coma's, or ſmall Portions of *Sound*, they ſuppos'd them all equal one to the other; a Poſition directly contrary to my Aſſertion. However, whether this Doctrine be now firſt brought to Light, or only recover'd out of the Duſt of Oblivion, I flatter my ſelf with Hopes that this my Performance, which has coſt me many a ſevere and painful Thought, may be the Means of exciting Perſons of Ingenuity to reduce that to Practice, which I have here ſhewn to be feaſible, and ſhall hereafter, demonſtrate by ſome Inſtances, when I occaſionally ſpeak of the Uſes to which this Scheme may be applied. The true and juſt Proportions of all harmonical *Sounds*, with their Degrees and Relations one to the other, are demonſtrated to the Ear by a Muſical String ſtrained, or a Pipe of an Organ; if either of them are divided according to the Examples already given.

All Muſical Intervals bear an Harmonical Relation, as well to the remaining Part of the *Sound* cut off as to the whole *Sound*: Or in other Terms, if a String be divided to any true point of Muſical Proportion; that Diſtance or Part of the String betwixt the two *Sounds* if ſounded, will give a Muſical Interval both to the Acuter and Graver *Sound*; that is to the other Part of the String, and likewiſe to the whole String. For the eaſier Conception of this I ſhall here exhibit the Examples in a Table;

The Difference between	is	and is	This give the Relation of	Which gives the Relation of a
D *b* 15 & C 16	1 to 16 of C	1 to 15 of D *b*	an Octave to C	※ 7th to D *b*
D 9 & C 10	1 to 10 of C	1 to 9 of D	a ※ 3d to C	a greater Tone to D
D 8 and C 9	1 to 9 of C	1 to 8 of D	a greater Tone to C	an Octave to D
E *bb* 7 & C 8	1 to 8 of C	1 to 7 of E *bb*	Octave to C	Extream ※ 6th to E *bb*
D ※ 6 & C 7	1 to 7 of C	1 to 6 of D ※	Extream ※ 6th to C	Perfect 5th to D ※
E *b* 5 and C 6	1 to 6 of C	1 to 5 of E *b*	Perfect 5th to C	※ 3d to E *b*
E 4 & C 5	1 to 5 of C	1 to 4 of E	※ 3d to C	Octave to E
F *b* 7 and C 9	2 to 9 of C	2 to 7 of F	a greater Tone to C	Extream ※ 6th to F *b*
F 3 & C 4	1 to 4 of C	1 to 3 of F	Octave to C	Perfect 5th to F
F ※ 5 and C	2 to 7 of C	2 to 5 of F ※	Extream ※ 6th to C	※ 3d to F ※
G *b* 7 & C 10	3 to 10 of C	3 to 7 of G *b*	※ 6th to C	Extream ※ 2d to G *b*

TABLE I. This comes between the 14th and 15th Pages.

The Difference between	is	and is	This gives the Relation of	and likewise gives the Relation of
G 2 & C 3	1 to 3 of C	1 to 2 of G	a perfect 5th to C	an Octave to G
G ✻ 9 & C 14	5 to 14 of C	5 to 9 of G ✻	✻ 4th to C	✻ 7th to G ✻
A *b* 5 & C 8	3 to 8 of C	3 to 5 of A *b*	Perfect 4th to C	✻ 6th to A *b*
A 3 & C 5	2 to 5 of C	2 to 3 of A	✻ 3d to C	Perfect 5th to A
B *bb* 7 & C 12	5 to 12 of C	5 to 7 of B *bb*	*b* 3d to C	✻ 4th to B *bb*
A 4 & C 7	3 to 7 of C	3 to 4 of A ✻	an Extream ✻ 2d to C	Perfect 4th to A ✻
B *b* 9 & C 16	7 to 16 of C	7 to 9 of B *b*	an Extream *b* 3d to C	*b* 4th to B *b*
B *b* 5 & C 9	4 to 9 of C	4 to 5 of B *b*	A greater Tone to C	✻ 3d to B *b*
B 8 & C 15	7 to 15 of C	7 to 8 of B	A greater Semi-Tone to C	an extreame *b* 3d to B
C 1 & C 2	1 to 2 of C	1 to 1 of C 1	An Octave to C 2	An Unison to C 1

Table II. *N. B.* The greater Number assigned to any Interval, belongs to C, the first Term, or whole Sound.

Col. IV.

The next Column is the *Fourth*, N° 4. in which is repreſented a Scale of a thouſand equal Parts, aſſign'd to the whole *Sound*; with the Numbers expreſſed, which ſhew how many Parts of the thouſand each Muſical Interval is aſſigned at, agreeable to the Proportions expreſſed in Column the *Third*.

The Qualities eſſential to this Scale are three.

Firſt, It ſheweth the exact Difference between greater and leſſer Intervals, or between any one *Sound* Muſical and another.

Secondly, It plainly diſcovereth and proveth the Inequality of Tones; which is the Occaſion of thoſe Defects we find in ſome Inſtruments; as Organs, Harpſichords, Spinets, Baſs-Viols, *&c.*

Thirdly, It demonſtrates the Coherence and Union of *Sounds* Muſical, when compounded together for harmonical Uſe.

For Example; If you would know the Difference between the perfect Fourth and perfect Fifth; find the Number aſſign'd to F the perfect Fourth, which is 750; likewiſe the Number aſſigned to *G* the perfect Fifth, which is *666*$\frac{2}{3}$: then examine the Difference between theſe two Numbers which will be 83$\frac{1}{3}$; then calculate what Proportion 83$\frac{1}{3}$ giveth to 750, which will be 1 to 9; then by Conſequence *G 666*$\frac{2}{3}$ gives to *F* the perfect Fourth 750 as 8 is to 9, the Proportion of a greater Tone. Again, to know the Difference between the greater Third and the perfect Fourth; ſee 800 aſſigned to the former, and 750 to the latter, then as before examine the Difference between 800 and 750, which is 50; this gives 1 to 16, of 800: Then is the perfect Fourth as 15 to 16, of the greater Third, the Proportion of a Diatonick Semi-Tone. Likewiſe between the greater Tone $888\frac{8}{9}$ and the perfect Fifth $666\frac{2}{3}$, the difference is $222\frac{2}{9}$, this gives 3 to 4 of the greater Tone, the Proportion of a perfect Fourth; then between the perfect Fifth $666\frac{2}{3}$ and the greater Sixth 600: the Difference is $66\frac{2}{3}$ this gives 1 to 10 of $666\frac{2}{3}$ then is the greater Sixth to the perfect Fifth as 9 is to 10 the Proportion of a leſſer Tone. In like manner the Difference between any two Intervals or any two *Sounds* may be found, and what Proportion they bear one to the other.

Likewiſe the ſame manner of proceeding diſcovereth and proveth the Inequality of Tones. For Example: If you examine the Difference between *D* the greater Tone $888\frac{8}{9}$ and *A* the great Sixth 600, you will find that *A* 600 will not give 2 to 3 of $888\frac{8}{9}$ which is the Proportion of a perfect Fifth; the Reaſon is plain; for if *D* the greater Tone, and *G* the perfect Fifth give the Term of a perfect Fourth, and *G* the perfect Fifth and *A* the greater Sixth, give but a leſſer Tone, then *A* the leſſer Tone to *G* cannot give a perfect Fifth to *D* the greater Tone: For, if you obſerve, in the firſt Example, the Difference between a perfect Fifth, and perfect Fourth was a greater Tone; whereas this is but the leſſer Tone, *A* being too flat to make a perfect Fifth to *D*, the greater Tone by the 81 Part of its own Value 600; and conſequently *D* is too ſharp for *A*, by the 81 Part of $888\frac{8}{9}$ which is the Difference between a greater and leſſer Tone, call'd a *Comma*.

To prove this, examine the Difference between the leſſer Tone 900, and the greater Tone $888\frac{8}{9}$, which is $11\frac{1}{9}$, this gives 1 to 81 of 900, then is *D* the greater Tone $888\frac{8}{9}$ ſharper or leſs in Sound than *D*, the leſſer Tone 900, by the 81 Part of 900, which is the Content and Complement of a Comma as aforeſaid. By this Example you may caſily comprehend the Notion of greater and leſſer Tones and their Difference. But further, as to the Inequality of Tones, calculate what Proportion *F* the perfect Fourth 750 bears to *D* the greater Tone $888\frac{8}{9}$, and you will find *F* 750 will not give as 5 to 6 of *D* $888\frac{8}{9}$, which is the Proportion of a leſſer Third : *F* being too flat for a leſſer Third to *D*, by the 81 Part of 750; But *F* 750 will give a leſſer Third to *D* 900, and likewiſe *A* 600 will give a perfect Fifth to *D* 900; whereas it will not to *D* the greater Tone $888\frac{8}{9}$.

The ſame Inequality is between the perfect Fourth 750, and the flat Seventh $555\frac{5}{9}$ the flat Seventh being too ſharp to give a perfect Fourth to *F* 750, by the 81 Part of $555\frac{5}{9}$; but the flat Seventh $562\frac{1}{2}$ will anſwer the Proportion.

To know by Inſpection the Difference between any two Intervals is thus performed. If you would know the Difference between *F*, the perfect Fourth, and *E*, the greater Third, obſerve the Proportions of each in the *Third* Column, *viz.*

The perfect Fourth 3 to 4

The greater Third 4 to 5

As theſe thus ſtand, multiply in a tranſverſe manner, the upper Number on the left Hand by the under Number on the Right; and the upper Number on the Right by the under Number on the Left, and the Product is 15 to 16, which proves *F* the perfect Fourth to be as 15 to 16 of *E* the greater Third, or a diatonick Semi-Tone, and ſo of the reſt.

By theſe Examples you may eaſily perceive greater and leſſer Tones are the real Occaſions of the Defects we find in ſome Muſical Inſtruments as aforeſaid, and that Nature is no ways deficient, but Art, which doth not expreſs her ſo perfectly as ſhe ought to do; and all Perſons, who deny the Aſſertion of greater or leſſer Tones, will find themſelves in a great Miſtake, upon making a true Inquiſition into the Nature of *Sounds* Muſical.

There are ſeveral other Deficiencies, which do happen in the aforemention'd Inſtruments, occaſion'd by the Inequality of Semi-Tones; examine the Difference between *E* the greater Third 800, and *E* the leſſer Third $833\frac{1}{3}$, the Difference is $33\frac{1}{3}$, this gives 1 to 25 of *E* the leſſer Third; then is *E* the greater Third 800, as 24 is to 25 of *E* the leſſer Third: the Proportion of that Semi-Tone between a greater and leſſer Third: This Semi-Tone is no more than a greater Quarter of a ſuperfluous Tone, or what is called *an extream ſharp Second*, as ſhall be demonſtrated hereafter, when I come to Column the 15th, concerning the Harmonical Diviſion of Intervals.

The next Semi-Tone ariſes from the greater Third to the perfect Fourth; the Proportion of this Semi-Tone is as 15 to 16, whereas the Proportion of the other is 24 to

25 : Here you may perceive that the Inequality of eſe two Semi-Tones is almoſt the double of that of the eater and leſſer Tones. But for a further Demonſtraon, examine the Difference between *C* Sharp 960, and Flat 937 $\frac{1}{2}$ which is 22$\frac{1}{2}$, this gives 9 to 384 of 960, hich in effect is ſomething leſs than a direct Quarter of leſſer Tone; for 9 to 384 is the ſame Proportion as 1 42$\frac{2}{3}$: Now 1 to 10 is the Difference between the two ounds of a leſſer Tone, and is the ſame in Proportion 4 to 40, and conſequently the fourth Part of this Difrence will be as 1 is to 40, whereby it is plain that the ifference between theſe two Semi-Tones is very near a uarter of a leſſer Tone.

The ſame Difference according to the Alteration of eys will happen between

D Sharp and *E* Flat.
E Sharp and *F* Flat.
F Sharp and *G* Flat.
G Sharp and *A* Flat.
A Sharp and *B* Flat.
B natural and *C* Flat.
B Sharp and *C* natural.

Now the aforeſaid Inſtruments, expreſſing, as they are ow fixt, but one of theſe two Terms of a Semi-Tone, muſt neceſſarily produce a falſe and diſagreeable Term mongſt ſome of the Keys, both in Paſſage and Tranſpoſition.

Two greater Semi-Tones are naturally required in an Octave, both in a Flat and Sharp Key. The firſt Semi-Tone in a Flat Key ariſes from the greater Tone to the

leſſer

leſſer Third, the ſecond from the perfect Fifth to the leſſer Sixth. The firſt in a Sharp Key ariſes from the greater Third to the perfect Fourth; the ſecond from the greater Seventh to the Octave. And here by Tranſpoſition from one Key to another the Deficiency of the Organ, Harpſichord, *&c.* are made apparent, for ſometimes leſſer Semi-Tones appear inſtead of greater, at other times greater inſtead of leſſer, which would never happen if theſe two Terms of Semi-Tone were expreſſed, as my Opinion is they eaſily might; then would one ſupply the Place of the other, as in *A* with a Sharp Third the greater Semi-Tones are from *C* Sharp to *D* natural, and from *G* Sharp to *A*, but if in *E* Flat with a Sharp Third, then from *G* to *A* Flat and from *D* to *E* Flat the Key-Note, 'Tis obſervable that any Semi-Tone mark'd either Flat or Sharp, is always the leſſer to that Note of whoſe Name it partakes, and contrariwiſe the greater to that Note of whoſe Name it partakes not; For Example, between *C* and *C* Sharp is a leſſer Semi-Tone and likewiſe between *D* and *D* Flat, but *C* to *D* Flat, and from *C* Sharp to *D* natural is a greater, they not partaking of the ſame Name.

Col. V and VI.

Column the *Fifth* ſheweth how *Sound* is divided into Muſical Intervals; called *Concords* and *Diſcords*, with their Names aſſigned to each. Column the *Sixth* contains the Characters by which they are known. All Muſical Intervals are comprehended within the Space of one Octave, many Octaves being us'd for the Benefit of Variation, and to allow Scope for the Exerciſe of the Compoſer's Fancy.

I am not inſenſible of the Terms the ancient *Grecians* and *Latins* gave to Muſical Intervals; yet foraſmuch as they are obſolete and now out of Uſe, more modern ones having been ſubſtituted in their Place, I have us'd the latter both in Name and Character: But here it is neceſſary to declare, that I have been not a little puzzled in denominating ſome both Intervals and Characters, which I have not yet ſeen diſtinguiſh'd by any Muſical Author. For Inſtance, there are two Intervals of the ſame Denomination and Character, *viz.* *D* the greater Tone from *C* which has two Terms, the one being the greater the other the leſſer Tone. For Diſtinction, I have placed *l* to, to the leſſer Tone, and the other ſtands as it was; for I would carefully avoid the Introduction of any thing new in the Theory of Muſick, but what is of abſolute Neceſſity. The next Inſtance is the extream Flat Third, which is an Interval between the greater Tone or Second, and the extream Sharp or greater Second; this I have diſtinguiſh'd by a double Flat. The Reaſon of naming it an extream leſſer Third, is becauſe there are already ſo many different Seconds, that I could not poſſibly diſtinguiſh any more: As for the extream Sharp or greater Second I give it the Character of a double Sharp: The next is an extream greater Sixth, diſtinguiſh'd by a double Sharp; an Interval, which, although it is one of the moſt harmonical Intervals in the Octave, as alſo one of the moſt neceſſary; yet I have not ſeen it Diſtinguiſh'd or Characteriz'd by any Author yet extant: The Uſe of this Interval ſhall be declared when I come to the Sixteenth Column, which ſhews the compounding of the extream Intervals. The next is the extream leſſer Seventh, which I have mark'd with a double Flat. The next is two leſſer Sevenths, the leſſer one mark'd with an *l*, and are a greater and leſſer Tone from the Octave, and of the ſame Affinity with the two *D*'s aforementioned, ſometimes one being required, ſometimes the other. The laſt Inſtance is the extream greater or ſharper Seventh, mark'd with a double Sharp. As to Sharp upon Sharp, and conſequently Flat upon Flat, which is now in uſe among Maſters, I follow their Examples in writing them ſo, for this Reaſon; that it is prejudicial to the Study of any Science, to clog it with any new Terms but what are abſolutely neceſſary; or introduce new ones when the old are ſufficient, and ſince we readily apprehend the Things they denote, 'tis needleſs to propoſe to encourage ſuch Novelties.

Col. VII.

Column the *Seventh* ſheweth the Octave, or half of the whole *Sound*, divided into Fifty ſix Particles, called *Comma's* with their Numbers and Fractions aſſigned to each Muſical Interval of *Sound*. *N. B.* One Comma is that Difference which is between a greater and leſſer Tone.

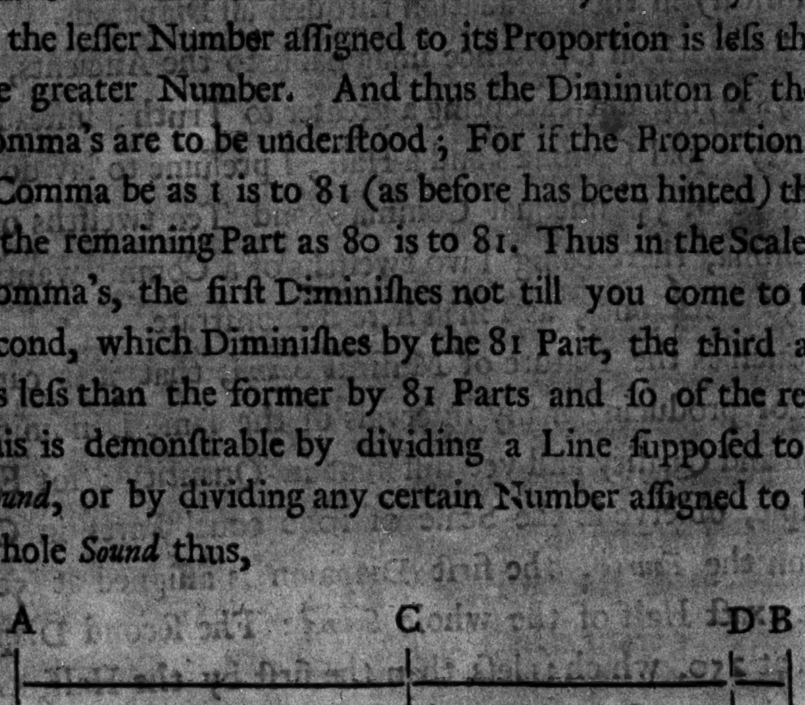
Theſe Comma's are not equal one to the other, there being the ſame Inequality in theſe Proportionably as in Tones, which conſiſt of far greater Parts of *Sound:* The

Diminution of theſe Comma's one to the other, is by the eighty one Part.

The Ancients aſſign'd nine Comma's to a whole or greater Tone, the Reaſon may be, becauſe the greater Tone being the Ninth Part of the whole *Sound*, and one Comma the Eighty one Part of the whole *Sound*, (for Nine times Nine gives Eighty one) therefore in conſequence, the greater Tone muſt include Nine of thoſe Comma's, and the Octave, or the Half of the Whole *Sound* Forty and a Half: But by their ſuppoſing thoſe Comma's all alike equal, their Syſtem was rendered incapable of ſhewing the Perfection of Muſical *Sounds:* And this ſtands as a Proof that they had not a juſt Idea of the Diminution of thoſe Comma's (and, conſequently all *Sounds* Muſical) in their Gradation through all Diapaſons.

But with all Difference imaginable to the Ancients, always ſaving and excepting a greater to Truth; inſtead of Forty equal Comma's and a Half; I preſume to lay down a Scale of 55 unequal Comma's and Ten twelfths of a Comma, there being Two twelfths of a Comma wanting of 56 entire ones, as I ſhall here demonſtrate.

Such is the Nature of Muſical *Sound*, that it is capable of producing many Intervals of the ſame Denomination and Quality and yet different in Quantity; for Example, obſerve in the Scale of 1000 equal Parts in Column the *Fourth*, the firſt Diapaſon is aſſigned at 500, the exact Half of the whole *Sound*: The ſecond Diapaſon at 250, which is leſs than the firſt by the Half, *viz.* as 1 is to 2 of 500: The third Diapaſon at 125, leſs by the Half than the Second, or as 1 is to 2 of 250. In like manner all Diapaſons gradually aſcending diminiſh one leſs than the other, by that Part which expreſſes its Proportion; thus, if the Proportion of a perfect Fifth be as 2 to 3, then is the next perfect Fifth ariſing in the Octaves, leſs than the Firſt by the third Part; for Example, if *G* $666\frac{2}{3}$ gives as 2 to 3 of *C* 1000, then is *G* a third Part leſs than *C*; and if you make another perfect Fifth to *G* which will be at *D*, the greater Tone $444\frac{4}{9}$ in the ſecond Diapaſon; then is *D* $444\frac{4}{9}$ leſs than *G* $666\frac{2}{3}$ by the third Part; and likewiſe the Difference between the two *Sounds* is leſs than the Difference between *C* and *G* by the third Part. Therefore this is diligently to be noted that all Intervals of the ſame Denomination gradually ariſing in the aforeſaid manner diminiſh one to the other leſs by ſo many Parts as the leſſer Number aſſigned to its Proportion is leſs than the greater Number. And thus the Diminuton of theſe Comma's are to be underſtood; For if the Proportion of a Comma be as 1 is to 81 (as before has been hinted) then is the remaining Part as 80 is to 81. Thus in the Scale of Comma's, the firſt Diminiſhes not till you come to the ſecond, which Diminiſhes by the 81 Part, the third ariſes leſs than the former by 81 Parts and ſo of the reſt; this is demonſtrable by dividing a Line ſuppoſed to be *Sound*, or by dividing any certain Number aſſigned to the whole *Sound* thus,



A, B, repreſents a Muſical String, C, B, the Half; divide the Whole String into 81 equal Sarts, then take off one of thoſe Parts at D, which will be the firſt Portion or Comma; then to have a ſecond Portion to be leſs than the firſt by the 81 Part, divide the remaining Part of the Line into 81 equal Parts which will produce the Contents of the ſecond Comma; again, to have a third Portion or Comma leſs than the ſecond by the 81 Parts, divide the remaining Part of the Line into 81 Part then as before take off one of thoſe Parts which will be the third Portion; ſo in like manner proceed till you côme to the middle of the Line,and then you will find what Number of Portions or Comma's will be between *C* and *B* the Half of the Whole Line, and likewiſe what Number of Comma's between any two *Sounds*: But to proceed to the Fractions or Twelfths of Comma's, being the ſmalleſt Portions of *Sound* which the Ear poſſibly can diſtinguiſh to be either more Grave or Acute, *i. e.* Flatter or Sharper: 'Tis obſervable that an Interval ſeldom unites at even Comma's; for Example, in the Diatonick or common Scale, a greater Tone includes Nine Comma's and Six Twelfths of a Comma, a leſſer Tone, Eight Comma's and Six Twelfths, a Semi-Tone Five Comma's and Two Twelfths; theſe together make a perfect Fourth, therefore Twenty three Comma's and Two Twelfths are aſſigned to the perfect Fourth; likewiſe Thirty two Comma's and Eight Twelfths aſſigned to the perfect Fifth, which is the Complement of a greater Tone more than the perfect Fourth, *viz.* Nine Commas and Six

Twelfths, which ſignifies a greater Tone, by which the perfect Fourth and perfect Fifth differ. Again, Forty one Comma's and Two Twelfths are aſſigned to the greater Sixth, which is Eight Comma's and Six Twelfths more than what are aſſigned to the perfect Fifth; this ſignifies a leſſer Tone, by which a greater Sixth and perfect Fifth differ. Likewiſe Fifty Comma's and Eight Twelfths are aſſigned to the greater Seventh, which is Nine Comma's and Six Twelfths more than what are aſſigned to the greater Sixth; this ſignifies a greater Tone Sharper than the greater Sixth, by which the greater Seventh and greater Sixth differ: Laſtly, Fifty five Comma's and Ten Twelfths are aſſigned to the Octave, which is Five Comma's and Two Twelfths more than what are aſſigned to the greater Seventh; this denotes a Diatonick Semi-Tone Sharper, by which the Octave and the greater Seventh differ. Alſo all other Muſical Intervals are aſſigned in theſe two Columns at their proper Number of Portions or Comma's, together with their Fractions.

Theſe Particles are the minuteſt Part of *Sound* diſtinguiſhable to the Ear; One of them being that Difference between Perfection and Imperfection, commonly call'd *being in, or out of Tune.* If you divide *Sound* into a leſſer Part or Body it is not Diſtinguiſhable, and conſequently of no Uſe or Application: If you enlarge theſe Particles it will cauſe a Confuſion in the greater Bodies, theſe being compounded of thoſe; for wherever in this Scheme the greater Bodies Unite and Incorporate, it muſt be at ſuch a Determinate Number of the ſaid Particles as are aſſigned. One of theſe Particles more or leſs (ſuch is the extraordinary Conſequence of their Numerical Aſſignment) being ſufficient to fruſtrate the Intention of the Scheme, and render it of none Effect.

Theſe Particles in their Gradation through the firſt Octave or Diapaſon ariſe one leſs than the other, by the 961 Part.

And here give me leave to obſerve to you the Analogy and Coherence of all the Parts of this Scheme one with the other. Firſt, the principal Intention of this Scheme is to demonſtrate and ſhew the eſſential Qualities both as to Matter and Form of all *Sounds* Muſical. As to the Matter of *Sound*, it exiſts in, and is expreſſed by theſe Particles or ſmalleſt Bodies of *Sound*; and as theſe Particles are the conſtituent Parts which give the Modality of Exitance to all greater Bodies, ſo theſe greater Bodies bear of neceſſity a Proportional Conformity of Diminution to theſe Particles. All theſe greater Bodies or Intervals you find diſtributed and diſpoſed of on the Lines which are drawn croſs the Scheme, together with their reſpective Aſſignments of Diminution, as they ariſe in the Octave expreſſed; Firſt by Comma's with their Subdiviſions of Fourths and Twelfths, as well for the readier Apprehenſion as exact Diſtribution. Further, the Scale of 1000 equal Parts is divided in Similitude and Proportion to the Diagonal Line of Diminution and Column of Comma's, ſo that you ſee the Line of Diminution, the Scale of Comma's with their Subdiviſions, and the Scale of

1000 equal Parts, mutually co-operate to produce a true and exact Ratio to the whole Syſtem. And theſe are the three corner Stones which ſupport the whole building of the Scheme, which if diſpoſed and placed in an exact Conformity to each other (which I flatter my ſelf to have here perform'd, and without which I confeſs the Work would want a proper Baſis) then is the Scheme ſecured from any violent Attacks which might endanger its Foundation. And as for the trifling Cenſures of the Ignorant and Malicious (an Accident to which the beſt Performances are liable) they are of no more regard than the Breath that produces them. The reſt of the Columns in the Scheme are wholly guided, directed, and fixed according to the principal Canon, or Univerſal Law of *Sound* Muſical here deſcribed; for the Truth of any Propoſition depends on the Conformity of it to the Rule, Law, or Principle it is guided and directed by; and whether the Law or Principle I build on be true and ſufficient to the deſigned Purpoſes, I here offer to the Conſideration of the Judicious, by whom only I am content to be corrected; and if upon due Examination it is found that the Premiſes be true, the Concluſion will naturally follow, *i. e.* of the Doctrine of Diminution, on which I build the whole Syſtem be true, then are all Muſical *Sounds* brought to an Aſſignment, True, Exact, and Mathematical, and conſequently the true Nature and eſſential Properties of all *Sounds* Muſical elucidated.

As to the uſe this Scale of Comma's it is the eaſieſt Method and readieſt Manner of Computation in the whole

Scheme; for although I could not avoid mentioning the Uſe of the Scale of 1000 equal Parts, when the Order in the Scheme required (it being placed for the Conveniency of extending it the whole Length of the ſix Diapaſons) yet this Scale of Comma's with its Subdiviſions is the principal Exemplar or Pattern, by which the Scale of 1000 equal Parts is regulated; and although the ſaid Scale may be acceptable to Perſons of a Mathematical Genius, yet the purely Muſical Practitioner will readier conceive and compute all Muſical Intervals by this Scale of Comma's. The excellent Uſes of this Scale of Comma's are as followeth. Firſt, it ſhews the Perfection of all harmonical *Sounds*, ſo far as the Ear can poſſibly diſtinguiſh; the Ear, which is the *Supreme, Sole,* and competent Judge of all *Sounds* Muſical. If any one queſtions whether *Sound* is to be diſtinguiſh'd and divided into ſo Critical and Minute a Part or Portion as the Twelfth of a Comma? I anſwer Yes, very eaſily, and, as I declared in the Preface, I am ready at any Time to make their own Ears the Judges, whereby they ſhall be as ſenſible of the Truth of this Propoſition as my ſelf; for Fact and not Chimera is what I build upon, ſeveral Ingenious Gentlemen and eminent Maſters of Muſick having ſeen the Operation performed to their intire Satisfaction.

It is not effected by dividing a Muſical String, or cutting of Pipes, which is impracticable, but the Operation is plain and ſimple, which carries Conviction with it at firſt Sight and Hearing; and is performed on any Organ or Harpſichord, but much better on the former, without the leaſt Detriment to the Inſtrument.

The Second Uſe of this Scale is the ſhewing the Difference between greater and leſſer Intervals, or between any two Muſical *Sounds*.

Thirdly, it manifeſteth the Inequality of Tones.

Fourthly, it diſcovers what Intervals two, three, or more will unite and incorporate together, and what not when compounded for harmonical Uſe; which is expreſsly laid down in Column the *Fourteenth*.

Fifthly, It demonſtrates the manner of Diminution of *Sounds* as they aſcend into and paſs through all Diapaſons.

For Example to know the Difference between *F* the perfect Fourth and *G* the perfect Fifth, count the Comma's contain'd between them, which are 9 and 6 Twelfths of a Comma, this includes a greater Tone, by which a perfect Fourth and perfect Fifth differ. The ſame Number of Portions are alſo contained between *D* Flat, the leſſer Second, and *E* Flat the leſſer Third; between the extream leſſer Third and leſſer Fourth; between the leſſer Sixth and leſſer Seventh; between *A* the greater Sixth and *B* the greater Seventh; between the ſharp Fifth, and the extream greater Sixth; between the Octave, and leſſer Seventh whoſe Proportion is 9 to 16.

Thus 9 Comma's and 6 Twelfths, including a greater Tone, is the Difference between each of the aforementioned Intervals, and if you examine the Difference by the Scale of 1000 equal Parts in Column 4, the Difference will be 1 to 9 of the Graver *Sound*.

Likewiſe to know the Difference between the leſſer Third and *F* the perfect Fourth, count the Comma's contained between them, which are 8 and 6 Twelfths, this includes a leſſer Tone, by which a leſſer Third and perfect Fourth differ; the ſame Number of Portions are contained between the greater Second and the greater Third; the leſſer Fourth and the imperfect Fifth; the greater Fourth and the ſharp Fifth; the perfect Fifth and the greater Sixth; the leſſer Sixth and leſſer Seventh, whoſe Proportion is 9 to 16; the Octave and leſſer Seventh, whoſe Proportion is 5 to 9; this Number of Portions, *viz.* 8 and 6 Twelfths denots the Term of a leſſer Tone as may be proved by Numbers in the Scale of 1000 equal Parts.

Again, to know the Difference between the greater Third and perfect Fourth, count the Comma's between them, which are 5 and 2 Twelfths, this denotes a Diatonick Semi-Tone, by which a greater Third and perfect Fourth differ. The ſame Number of Portions are contained, between *C* the firſt *Sound* and *D* Flat the leſſer Second, the greater Second and the leſſer Third, the perfect Fifth and the leſſer Sixth, the greater Sixth and leſſer Seventh, the greater Seventh and the Octave.

The Examples of the whole, digeſted in a Table follows.

The Number of Portions that Includes

A Leſſer Semitone is 3 Comma's & 4 Twelfths of a Comma, the ſame is betwixt	A Leſſer Tone is 8 $\frac{6}{12}$ the ſame is betwixt	An Extream Leſſer Third is 10 $\frac{8}{12}$ the ſame is betwixt
C & C♯	C & $\overset{L}{D}$	C & E*bb*
D*b* & $\overset{L}{D}$	D & E	D & F*b*
E*b* & E	E*b* & F	D♯ & F
A*b* & A	F*b* & G*b*	E & G*b*
B*b* & B	F♯ & G♯	F♯ & A*b*
C*b* & C	G & A	G & B*bb*
	A*b* & $\overset{L}{B}$*b*	G♯ & $\overset{L}{B}$*b*
	B*b* & C	A♯ & C

A Diatonick Semitone is 5$\frac{2}{12}$ the ſame is betwixt	A Greater Tone is 9 $\frac{6}{12}$ the ſame is betwixt	An Extream Greater ſecond is 12 $\frac{5}{12}$ the ſame betwixt
C & D*b*	C & D	C & D♯
D & E*b*	$\overset{L}{D}$ & E	E*bb* & F
E & F	E *bb* & F*b*	E*b* & F♯
G & A*b*	F & G	F*b* & G
A & $\overset{L}{B}$ *b*	G♯ & A♯	F & G♯
B*b* & C *b*	A*b* & B*b*	G*b* & A
B & C	A & B	G & A♯
	$\overset{L}{B}$*b* & C	B*b* & *b*C

The Number of Portions that Includes

A Leſſer Third is 14 $\frac{8}{12}$ the ſame is Betwixt

C	&	E*b*
C※	&	E
L		
D	&	F
D※	&	F※
E	&	G
F	&	A*b*
G*b*	&	B*bb*
G	&	B*b*
A*b*	&	C*b*
A	&	C

A Leſſer Fourth is 20 $\frac{3}{12}$ the ſame is Betwixt

C	&	F*b*
L.		
D	&	G*b*
D※	&	G
F	&	B*bb*
F※	&	B*b*
G※	&	C
A※	&	y^{e} ※9th
L		
B*b*	&	y^{e} *bb*10th

A Greater Third is 18 the ſame betwixt

C	&	E
D*b*	&	F
E*bb*	&	G*b*
E*b*	&	G
F	&	A
F※	&	A※
G	&	B
A*b*	&	C
A	&	C※

A Perfect Fourth is 23 $\frac{2}{12}$ the ſame is betwixt

C	&	F
D	&	G
D※]	&	G※
E*b*	&	A*b*
E	&	A
F*b*	&	B*bb*
		l.
F	&	B*b*
G	&	C

A Perfect Fourth is 23 $\frac{2}{12}$ the ſame betwixt Ab & ye b9th L A & ye ✱9th Bbb & ye bb10th A✱ & ye ❋9th Bb & ye b10th B & ye ✱10th	A Flat Fifth is 28 $\frac{9}{12}$ the ſame is betwixt C & Gb D✱ & A Eb & Bbb F✱ & C L G✱ & ye ✱9th Ab & ye bb10th A✱ & ye ✱10th Bb & ye b11th	A Sharp Fifth is 35 $\frac{7}{12}$ the ſame is betwixt C & G✱ D & A✱ L Ebb & Bb Fb & C L Gb & ye ✱9th G & ye ❋9th Bbb & ye 11th B & ye ✱11th
A Greater Fourth is 27 $\frac{1}{12}$ the the ſame is betwixt C & F✱ L D & G✱ Ebb & Ab E & A✱ Fb & Bb Gb & C A & ye ❋9th Bbb & ye b10th	A Perfect Fifth is 32 $\frac{8}{12}$ the ſame is betwixt C & G Db & Ab L D & A Ebb & Bbb D✱ & A✱ Eb & Bb E & B F & C G & ye ✱9th G✱ & ye ❋9th Ab & ye b10th A & ye ✱10th Bbb & ye b11th Bb & ye 11th	A Leſſer Sixth is 37 $\frac{5}{12}$ the ſame is between C & Ab C✱ & A D & Bb Eb & Cb Eb & Cb E & ye 8th F & ye b9th Gb ye bb10th G & ye b10th A & ye 11th A✱ & ye ✱11th B & ye 12th

A Greater Sixth is $41\frac{2}{12}$ the ſame is betwixt

C	and	A
D*b*	and	L B*b*
D	and	B
E*b*	and	C
E	and	C※
F	and	ye ※9th L
F※	and	ye ❋9th
G	and	ye ※10th
A*b*	and	ye 11th
B*bb*	and	ye *b*12th
B*b*	and	ye 12th
C*b*	and	ye *b*13th
C	and	ye ※13th

An Extream Greater Sixth is $45\frac{1}{21}$ the ſame is betwixt

C	and	A※
E*bb*	and	C
F*b*	and	ye ※9th
G*b*	and	ye ※10th
A*b*	and	ye ※11th
B*bb*	and	ye 12th
L B*b*	and	ye ※12th
C	and	ye ❋13th
E*bb*	and	ye 15th

An Extream Flat Seventh is $43\frac{5}{12}$ the ſame is between

C	and	B*bb*
D※	and	C
F	and	ye *bb*10th
F※	and	ye *b*10th
G	and	ye *b*11th
G※	and	ye 11th
A	and	ye *b*12th
A※	and	ye 12th
C	and	ye *bb*14th
D※	and	ye 15th

A Leſſer Seventh is $47\frac{4}{12}$ the ſame betwixt

C	and	B*b*
C※	and	B
D*b*	and	C*b*
L D	and	C
E	and	ye ※9th
F	and	ye *b*10th
G*b*	and	ye *b*11th
G※	and	ye ※11th
A	and	ye 12th
L B*b*	and	ye *b*13th
C	and	ye *b*14th

Col. VIII and IX.

The Eighth *Column* contains the Numbers of the Commas from one to fifty ſix, and has a peculiar Reference to the ninth *Column*, which ſheweth by Numbers, the particular Diminution aſſigned to each Comma ariſing in the firſt *Octave*, agreeable to the Doctrine of Diminution exhibited in the *Scheme*.

Col. X.

The Thenth *Column* ſheweth, the *Octave* divided into 600 and 70 Particles, called Twelfths of Commas, with Their Numbers aſſigned to each muſical Interval.

Col. XI.

The *Eleventh* Column ſheweth where greater and leſſer Tones and Semitones, take place in the Diatonick Scale: Muſick, as all other Sciences Roſe to the Perfection it has acquired by Degrees, as you may read in Dr. HARRIS's *Lexicon Tecknicum*, Vol. 2*d*, under the Word Muſick, who there informs you that *Ariſtoxenus* a *Grecian*, was the firſt who fixt the Terms of an Octave, according to the Recception of *Sound* by the Ear. After that *Pythagoras* a *Grecian* alſo, ſettled them agreeable to the Rules of Mathematical Proportion; and *Laſtly*, *Ptolemy* an *Egyptian*, brought up the Diſtinction of a greater and leſſer Tone, which holds good to this Day; Theſe Inventions gave Riſe to the Three *Grecian* Scales of Diatonick, Chromatick and Enharmonick.

The Diatonick Scale, (which ſignifies a Scale of Plain Song) is the common Scale now in Uſe and conſiſts of *ſeven* Parts, or Intervals of *Sound* contain'd within an Octave; five of which are diſtinguſh'd by the Name of Tones, Three greater and Two leſſer, otherwiſe expreſſed by *Major* and *Minor*; and Two Semitones or half Notes; their order in the Scale are as follows:

D expreſſes the Quality of a Tone Major to *C*, and gives the Proporti on of 8 to 9 of *C*, which is a greater Second. *E* giveth a Tone Minor to *D*, and is 9 to 10 of *D*, and 4 to 5 of *C*, a greater Third. *F* gives a Semitone to *E*; as 15 to 16 of *E*, and 3 to 4 of *C*, a perfect Fourth, *G* gives to *F*, a Tone Major as 8 to 9 of *F*, and 2 to 3 of *C*, a perfect Fifth. *A* gives a Tone Minor to *G* as 9 to 10 of *G*, and 3 to 5 of *C*, a greater Sixth.

B, gives a Tone Major to *A* as 8 to 9 of *A* and 8 to 15 of *C*, a greater Seventh. *Laſtly C* the Octave gives a Semitone to *B*, as 15 to 16 of *B*, and 1 to 2 of *C* the firſt *Sound*.

This Diſpoſition of greater and leſſer Tones and Semitones is abſolutely Neceſſary to the procuring a juſt Concordance in compound Muſick, otherwiſe the Principal Intervals would have no mutual connection, but would be removed from their proper point of perfect Proportion, which will occaſion very harſh Coincidences and ſo deſtroy Harmony.

I confeſs, were Muſick confin'd to a Single part; or (as in a Ring of Eight Bells) a more agreeable Proportion of Tones and Semitones, may be found than what theſe

Scales contain; for Inſtance, in a Peal of Eight Bells; the Second Bell ariſing from the Tenor, (or according to a Ringer's Expreſſion, the Seventh) is as 8 to 9 of the Tenor, which is a full Tone; the third as 8 to 9 of the Second, and 84 to 81 of the Tenor; the fourth Bell as 243 to 256 of the third, and 3 to 4 of the Tenor, a perfect fourth to the Tenor. The fifth, as 8 to 9 of the fourth, a perfect fifth to the Tenor. The Sixth, as 8 to 9 of the Fifth, and 240 to 405 of the Tenor. The ſeventh as 8 to 9 of the ſixth, and 216 to 405 of the Tenor. The Eighth or leaſt Bell, as 243 to 256 of the Seventh, and as 1 to 2 of the Tenor. By this Means the whole Notes are all made greater *Tones*, and half Notes have a nearer Relation than ordinary to what properly may be call'd a Semitone; and thus a Peal of Bells will riſe with a lively Air and full of Spirit.

Col. XII.

The Twelfth Column contains the greater and leſſer Tones, ariſing in a flat Key; and differs from the Eleventh Column only in the Order; one being in a Sharp Key, the other in a Flat.

Col. XIII.

The Thirteenth Column Sheweth where greater and leſſer Semitones ariſe in the Chromatick Scale.

This is the ſecond Scale of the *Grecians*, and conſiſts of the Diviſion of an Octave into twelve Parts or Intervals, and are commonly known by the Names of Semitones or half Notes, not that each is preciſely ſo, there being a great Inequality in theſe Semitones in their Gradation, as you may perceive by Examination of this Column.

Col. XIV.

The Fourteenth Column ſheweth how Intervals 2, 3, or more, are compounded together, by which may be ſeen what will bind, and ſtand in muſical Concordance, and what will not. This Column conſiſts of ſeveral ſtreight Lines, in the Spaces between each of which are contain'd thoſe Intervals which will unite together. The ſixteenth Column relates likewiſe to this Subject, and contains the extream Intervals, as the fourteenth doth the more uſual and common Intervals.

Whatever Intervals, 2, 3, or more, are contain'd in one Space, do unite, taken any Way, by changing the Order or omitting any of them, except two; and if you examine the Difference between any one Interval and another, by counting the Commas contain'd between them, you will find that Difference to give the Proportion of ſome muſical Interval, or otherwiſe they will not unite together. Example, The greater Third, perfect fifth and eight, are ſuppos'd to be in Concordance together in the firſt Space; count in the ſeventh Column the Number of Commas that are between the two croſs Lines, which include the third and fifth, which are fourteen and eight twelfths of a Comma; then look for fourteen and eighth twelfths in the ſame Column, as they are numerically expreſs'd, and againſt that number you will find in the fifth Column a leſſer third expreſs'd, and upon the ſame croſs Line in the third Column you have its Proportion expreſs'd, *viz.* as 5 is to 6, this ſheweth that G, the perfect fifth, giveth the Term of a leſſer Third to E the greater Third, and is 5 to 6 of E. Again, count the Commas between the greater Third and Eighth, which is thirty ſeven and ten twelfths, then direct your Eye along the croſs Line, where thirty ſeven and ten twelfths are numerically expreſs'd, into the fifth and third Column and you will find its Name and Proportion, *viz.* a leſſer Sixth, and is as five to eight of the greater third. Likewiſe, count the Commas between the perfect fifth and eight, which are twenty three and two twelfths; then do as before, and you will find it gives the Term of a perfect fourth, and the eighth is as three to four of the perfect fifth.

Look in the ſeventh Space, and you will find the greater ſixth added to the aforeſaid third, fifth, and eighth. Count the Commas between the third and ſixth, which is 23 and 2 twelfths, this gives a perfect fourth, and A the greater ſixth is as 3 to 4 of E the greater third. Then between the fifth and ſixth, which is 8 Commas and 6 twelfths, this gives a leſſer Tone, A the ſixth being as 9 to 10 of G the fifth.

Then between the ſixth and eighth, which is 14 Commas and 8 twelfths, this gives a leſſer third, C the eighth being as 5 to 6 of A the greater ſixth. And thus you may proceed with all the reſt.

Another eaſy Method of Calculation is by the Scale of twelfths of Commas in the tenth Column, thus:

To know the Difference between the greater third and perfect fifth, look in the Numbers of the ſaid Column for 216, which you will find aſſign'd to the greater third and 392 to the fifth, then ſubſtract the leſſer Number from the greater, and the Remainder is the Difference, *viz.* 176, the ſaid Number you will find in this Column aſſign'd to the leſſer third; and ſo of the reſt. Thus you ſee there muſt of neceſſity be a uniting of all Intervals, contain'd in one Space, not only in General but in Particular; and that uniting muſt conſiſt of ſome known Interval; therefore all Composers are at Liberty to take or refuſe any of them; by this Means the Union and Concordance of all Muſical Intervals in Compoſition, is examin'd and prov'd, and I am confident all muſical Compoſition muſt, in this Particular, be conformable to this Scale, or it will be falſe.

Col. XV.

The fifteenth Column ſheweth the harmonical Diviſion of Intervals into greater and leſſer Halfs. This is perform'd by a mathematical dividing that Difference which is between any two Sounds of an Interval, into two equal Parts.

Example, The Octave mathematically divided into two equal Parts, the ~~leſſer~~ Half produces a Fourth, which Lower includes 23 Commas and $\frac{2}{12}$ the upper Half, from the fourth to the Octave, includes 32 Commas and $\frac{8}{12}$, which denotes a perfect Fifth. Here you may perceive the upper Half is the greater, in reſpect to harmonical Quality; and hence it is that we have greater and leſſer Thirds, greater and leſs Tones, and greater and leſs Semi-tones, ſo called, tho' neither greater nor leſs Semitones proceed or are deriv'd from greater or leſs Tones: For Inſtance, the greater Semi-tone D flat, 15 to 16 of C, is the equal Diviſion of the extream flat third, but in reſpect to Quality is the leſſer half including 5 Commas and $\frac{2}{12}$, whoſe Proportion is 14 to 15.

ye greater
half is 5 7/12

The ſame is between the extream Sharp 2d, and Sharp third; the flat 3d and flat 4th; the 4th and flat 5th; the ſharp fourth and 5th; the ſharp 5th and ſharp 6th; the flat 6th and extream flat 7th; the extream ſharp 6th and ſharp ſeventh.

The other Semi-tone, which is from C to C ſharp 24 to 25, proceeds from the exteam greater Second into 4 equal Parts, one of which expreſſes this Difference; there being no ſuch thing as a juſt Semi-tone practicable in Muſick; ſometimes one Proportion being requir'd, ſometimes the other: The ſame may be underſtood of quarter Tones; the neareſt relation of a greater quarter Tone being that of the extream greater Second to the leſſer Third; the Difference 1 to 36.

The ſame Proportions are between the greater 3d and flat 4th; the ſharp 5th and flat 6th; the greater 6th and extream leſſer 7th; the extream greater 6th and leſſer Seventh.

This is ſufficient to ſhew what is meant by greater and leſſer Intervals of what Denomination ſoever.

I ſhall here by one Example exhibit the Operation of harmonically dividing any muſical Interval into a greater and leſſer Half.

Example, If you would know the greater and leſs Half of the Octave, look in the third Column for its Proportion, which is 1 to 2.

First Place, the two given Numbers, which is the Proportion aforeſaid; thus in the Margent. Then double 1. the leſſer given Number, and it makes 2. which ſet down under 1. and add the two given Numbers of the Proportions together, and the Sum is 3. which ſet down to the Right-hand of 2. the double Number, and it ſtands 2. to 3. the Proportion of a perfect Fifth, the greater half of the Octave: Alſo ſet the ſaid Sum 3 to the Left-hand under 2. the double Number; then double 2. the greater Number of the given Proportion, and it makes 4. which place to the Right-hand of (3) the Number laſt ſet down, and it ſtands 3. to 4. as in the Margent; the Proportion of a perfect fourth, and is the leſſer half of the Octave.

1 to 2
2 to 3
3 to 4

The like muſt be done for any other Proportion in the ſaid 3d Column of the Scheme:

Example, Of the perfect Fifth.
2 to 3
4 to 5
5 to 6

Example, Of the perfect Fourth.
3 to 4
6 to 7
7 to 8

Col. XVI.

The 16th Column ſheweth the Compounding of the extrerm Intervals.

I ſhall here give a few Examples of the uniting and reſolving of ſome Intervals in this Column, which, in my Opinion, are worthy of Obſervation.

The extream Sharp Seventh will unite with the Flat Third and perfect Fifth, and is beſt reſolv'd into the

Eighth, the Baſs keeping its Place; the upper part ariſing in this Manner a Quarter of a Note, is very graceful in either flat or ſharp Key.

The extream Sharp 6 will unite with the greater third and perfect fifth, and doth harmoniouſly reſolve into a greater third; the Baſs riſing a perfect fourth or falling a perfect fifth at the ſame time: The extream ſharp ſixth falling a quarter Tone.

The Flat fourth will unite with the perfect fifth, and may ſerve inſtead of the greater third in a Cadence, in order to a Cloſe: The perfect fourth inſtead of falling a Diatonick Semi-tone into the greater third, falleth but a quarter Note in the Flat fourth, and the ſaid Flat fourth by riſing a quarter Note, is reſolved into the Eighth; the Baſs at the ſame time riſing a perfect fourth, or falling a perfect fifth.

These and ſeveral other Paſſages riſing or falling by a quarter Tone, is very agreeable and delightful to the Ear. For which Reaſon the ſharp fourth may ſerve inſtead of the flat fifth, and the flat fifth inſtead of the ſharp fourth; the extream ſharp ſixth inſtead of the flat ſeventh, the extream ſharp ſeventh inſtead of the natural ſharp ſeventh, the extream ſharp ſecond inſtead of the flat third, the extream flat third inſtead of the natural ſharp ſecond: And thus I leave the Conſideration of theſe and ſuch like Paſſages to judicious Compoſers, as Hints for the further Improvement of this noble Science.

More Intervals might have been thought of, and inſerted in this Column, but they would have been uſeleſs, I having put down all that the Ear can poſſibly admit of.

Col. XVII.

The ſeventeenth Column ſheweth where greater and leſſer quarter Notes ariſe in an Octave, applicable to the inharmonick Scale.

This is the third and laſt Scale of the *Grecians*, and lies under the Misfortune of an Uncertainty in ſetting down the Notes of which the Scale conſiſts; ſome Authors aſſigning the Characters of double and treble Sharps, together with the natural Notes; while others aſſign half Sharp and whole Sharp, Flat and half Flat, as they call it, together with the natural Notes: Which Diverſity of Judgment occaſions an Uncertainty in the Terms: However, I may venture to affirm, that all quarter Notes capable of harmonical Relation, are here inſerted; and conſequently muſt be as perfect as the Enharmonick Scale; which is all I intend to ſay on this Subject at preſent.

N. B. The Notes with their Names, contain'd in the muſical Lines and Spaces, are thoſe Notes which properly ſhould be inſerted in all Inſtruments which ſhould perform the Intervals requir'd in the Keys now in uſe, or would ariſe by Tranſpoſition from the ſaid Keys: But for thoſe Letters and Characters without Notes aſſign'd them, may be called additionals, which alſo would be required by further Tranſpoſitions not commonly uſed; but it ought to be conſidered at the ſame time, that neither theſe Additionals nor any elſe imaginable, are ſufficient to anſwer the Demand ariſing from continual Tranſpoſition; as any Perſon may be convinc'd of by peruſing the middle and under Plates of the muſical Index in this Treatiſe.

Col. XVIII.

The Eighteenth Column ſheweth the Number of Commas, together with their Fractions betwixt each Interval. The Fractions being plac'd within the double Line.

As to the Scheme for ſtopping a Violin in Tune, the Proportions are conformable to the great Scheme, and would be of excellent uſe to Learners, were it delineated on their Violins, as might very eaſily be perform'd.

I proceed to the Deſcription and Uſes of a Scheme circularly drawn and hereto annexed, which more clearly demonſtrates the Nature of the Scale of Commas, laid down in the great Scheme.

This circular Scheme conſiſts of three Parts or Plates, with their ſeveral Diviſions: The *Firſt* or undermoſt Plate, which is the largeſt of the three, is divided into fifty five Commas and ten twelfths, agreeable to the Scheme; each Comma is divided into twelve Parts or Portions; over which are plac'd, at their proper Number of Portions in the middle Space, the Names of the Notes by the firſt Letter; and in the outtermoſt Space, the numerical Relations of the ſaid Notes or Intervals, from the firſt Term of Sound C, which is the firſt Sound from whence all the other Intervals derive their Computations and Aſſignments: The next or middle Plate contains two circular Spaces, the outtermoſt referring to the undermoſt Plate, and the innermoſt to the uppermoſt Plate.

The outermoſt Space in the ſecond Plate, contains angular Pointers, within each of which are placed the Figures and Characters of each muſical Interval or Chord, which by Means of the ſaid Pointers direct to the abovementioned Notes on the undermoſt Plate. The third or uppermoſt Plate is an Index to what is contain'd in the ſecond circular Space of the middle Plate.

The ſaid Circle is divided into thirty one Columns, in each of which are contain'd the literal Names, with their ſeveral Characters, as *b*, ✻, *bb*, ✻✻. In the outter Circle of the uppermoſt Plate, is likewiſe contain'd thiry one Columns, anſwering thoſe in the middle Plate, in twenty two whereof the Figures and Characters which denote the Intervals or Chords are placed.

Thus I proceed to the Uſes, *Firſt*, Of the undermoſt Plate and outer circular Space of the middle Plate, which bear a mutual Relation to each other. Setting the *Gnomon* or *Flower-de-luce* on the middle Plate, to point right againſt C on the third or undermoſt Plate, you will find that each Interval in the middle Plate, by means of the angular Pointers, will direct to each Name of the Notes and their numerical Aſſignments, from C, expreſs'd in the two outer Spaces on the third Plate. But by altering the *Gnomon* to any other Note, you will at one View perceive the Perfections or Imperfections, true or falſe Coincidences of all fix'd muſical Inſtruments, as they ſtand in Relation to that Interval the *Gnomon* points to.

N. B. The Notes mark'd thus ⋈ with a Croſs, in the third or undermoſt Plate, are not in any common Organ, Harpſichord, Spinnet, Baſs-Viol, *&c.* This Operation likewiſe diſcovers which are the moſt perfect Keys on the ſaid Inſtruments: For *Example*, If you place the *Gnomon* at D, then E the ſharp ſecond or greater Tone, F the flat third, G ſharp the ſharp fourth, A the perfect fifth, C the flat ſeventh, and C ſharp the ſharp ſeventh, will each of them be one Comma too flat, and F ſharp the ſharp third, five twelfths of a Comma too flat, and thus you may examin the Relations of any Interval in the Scheme.

Another good Uſe and Property of this Inſtrument is, in ſhewing what any one Interval giveth to another, and alſo what Intervals will unite together, and what not, which is perform'd thus:

Suppoſing the firſt *Sound* at C (conformable to the great Scheme) and in this Calculation always referring to it, if you would know the Difference of a flat third and perfect fifth, ſet the *Gnomon* on the middle Plate exactly againſt the flat third in the outermoſt Space on the undermoſt Plate, then look for G the perfect fifth from C on the undermoſt Plate, and exactly againſt the ſaid G you will find a ſharp third plac'd on the middle Plate, which is the Diſtance or Difference required again, to find the Difference between a ſharp third and ſharp ſixth, ſet the *Gnomon* to the ſharp third from C, then look to the ſharp ſixth on the undermoſt Plate, and you will find a perfect fourth anſwering exactly to the ſharp ſixth, and ſo of the reſt.

It further ſhews what Intervals, as two, three, or more will unite with any one Interval you would know:

For *Example*, To know what Intervals will unite with the ſharp fourth, ſet the *Gnomon* to the ſharp fourth from C in the undermoſt Plate, then obſerve, that wherever the angular Pointers in the middle Plate, direct exactly to any Interval on the undermoſt Plate, thoſe are the Intervals that will unite with the ſaid ſharp fourth, which are the extream ſharp ſixth, the flat ſeventh, the eighth, the extream ſharp ſecond and the flat third: Then, keeping the *Gnomon* ſtill to the ſharp fourth, you may find by Inſpection of the Characters on the middle Plate, what Relations all theſe bear to the ſharp fourth; thus you will find the extream ſharp ſixth bears the Term or Relation of a ſharp or greater third to the ſharp fourth, likewiſe the flat ſeventh gives a flat fourth, the eighth gives a flat fifth, the ſharp ſecond gives a ſharp ſixth, and the flat third gives an extream flat ſeventh.

N. B. That in this Operation you are to ſuppoſe the Intervals in the under Plate, to be an Octave Sharper.

The Uſe of that Part of this circular Scheme contain'd in the innermoſt Space of the middle Plate, and the outermoſt Space of the uppermoſt Plate, is the ſhewing all the harmonical Relations of one Note to the other, taken in any Key whatſoever, and obſerve, that what Letter of a Note you fix the *Gnomon* at, that is made the firſt Term or Key. *Example*, Suppoſe E the Key to be examin'd, ſet the *Gnomon* on the uppermoſt Plate to E on the middle Plate, and you will find the Relation of the muſical Intervals to E ſtand thus; E ſharp will be an extream leſſer ſecond; F ſharp, the ſharp ſecond; G flat, the extream flat third; F double ſharp, the extream ſharp ſecond; G, the flat third; G ſharp, the ſharp third; A flat, the flat fourth; A, the perfect fourth; A ſharp, the ſharp fourth; B flat, the flat fifth; B, the perfect fifth; B ſharp, the ſharp fifth; C, the flat ſixth; C ſharp, the ſharp ſixth; D flat, the extream flat ſeventh; C double ſharp, the extream ſharp ſixth; D, the flat ſeventh: D ſharp, the ſharp ſeventh; E flat, the extream ſharp ſeventh; and the *Gnomon* ſtanding at E, may be ſuppos'd to point at E its Octave: Thus Learners may readily conceive the whole Nature of Tranſpoſition from one Key to another, without any Fatigue of perplexing Calculations; for whoſe ſake likewiſe I have contrived a Method in the ſaid upper Plate (referring to the middle Plate) to ſhew them all the Notes belonging to a flat and a ſharp Key; which conſiſts of a gradual Series of eight Notes, five of which, from the firſt Term or Key are called Tones, or whole Notes, (but in Strictneſs, three greater and two leſſer) and two Semitones or half Notes; whoſe Order, among themſelves, is different, according to the Key, *viz.* flat or ſharp, as is repreſented in Col. 11th and 12th of the great Scheme. The firſt Term or Key being the fundamental Note of a Tune, to which the other ſeven have their proper Relations, and with which the Baſs always concludes.

Properly there are but two Keys in Muſick, one flat, and one ſharp, which take their Denomination, not from the firſt Term or Key Note, nor with reſpect to what Flats or Sharps are placed at the Beginning of a Tune, but from the Relation which the third, ſixth, and ſeventh bear to the Key Note. A flat Key, is that which hath a flat or leſſer third, ſixth, and ſeventh joined with the

Key Note: A ſharp Key, is where a Sharp, or greater third, ſixth, and ſeventh appear with the Key Note. The ſecond, fourth, and fifth being the ſame Intervals in both Keys.

Within the ſecond Space of the upper Plate, are contain'd the Intervals with their Characters, belonging to a ſharp Key; being placed in their proper Columns: Within the third Space are the Intervals belonging to a flat Key, placed likewiſe in their proper Columns. As to the Uſe, ſuppoſing the Key to be C, ſet the *Gnomon* on the uppermoſt Plate to C on the middle Plate; and thoſe Notes on the middle Plate, which are pointed at by the Intervals of the ſecond Circle of the uppermoſt Plate, are the true Relations to C in a ſharp Key; which are D, E, F, G, A, B, and C, the ſame with the Octave. Again in a ſharp Key, ſuppoſe the Key in E flat, ſet the *Gnomon* at E flat, and then you will have F, G, A flat, B flat, C, D, the true Relations to E flat in a ſharp Key.

Examples in a flat Key. Suppoſe the Key to be A, ſet the *Gnomon* at A, and you will have B, C, D, E, F, and G pointed at, which are the true Relations to A, in a flat Key. Again, ſuppoſe the Key to be F ſharp, ſet the *Gnomon* at F ſharp, and you will have G ſharp, A, B, C ſharp, D and E, pointed at as the true Relations to F ſharp in a flat Key, and ſo of the reſt.

A vulgar Error prevails, in calling *Are* in a ſharp Key *Are* ſharp, or G ſharp, or D ſharp, *&c* and likewiſe in calling C in a flat Key, C flat, or F flat, or G flat; whereas, theſe being natural Notes, cannot have any

ſuch

ſuch Quality; but Flatneſs or Sharpneſs adheres and correſponds with them by way of Adjunct; therefore it ſhould be ſaid, *Are* with a ſharp third, *&c.* or, C with a flat third, *&c.*

The innermoſt Circle in the uppermoſt Plate, contains angular Pointers, which direct to the Notes on the middle Plate, and ſhew the chromatick Scale, taken from any Term or Key.

Thus I have gone through the Doctrine and Uſes of the whole Scheme: I intend (if this Performance meets with a favourable Acceptance from the Publick) to communicate ſome further Obſervations and Diſcoveries on this Subject. I have endeavour'd to render this Diſcourſe as intelligible as the Nature of the Subject will permit: Nevertheleſs, it is poſſible, ſome Perſons may find, at the firſt Peruſal, a little Difficulty in apprehending the Doctrine of this Scheme; but it ſhould be conſider'd, That there is ſcarce any Scheme which hath not its *Arcana* (at firſt Sight, not obvious to the Underſtanding) as well as its more eaſy Concluſions to ſatisfy it. Beſides, the Newneſs of the Doctrine, and Manner of treating on this Subject, may plead ſome Excuſe. If, after all, any Gentleman ſhould be willing to receive a more particular Information, I ſhall be ready at any time to comply with his Deſire, and ſatisfy him by Auricular Demonſtration (the only proper Proof of the Premiſes) that the Doctrines of the Scheme are founded on Truth: And I hope, upon the whole, it will appear, that my principal Aim and Intention herein, has been to reſcue this noble Science out of the Hands of Ignorance; to rectify vulgar Errors and Miſtakes concerning it, by demonſtrating the true Principles of Muſical *Sound*, to propoſe eaſy and rational Methods for Facilitating its Study, and to excite others to attempt its further Improvement; and conſequently, to procure a Regard and Encouragement ſuitable to its Excellence and Dignity.

FINIS.

ERRATA.

In the Preface. Page 7 *Line* 19 *read* which I at length. *p.* 8 *l.* 12 *read* any other's Sentiments.

In the Diſcourſe. P. 10 *l.* 4 *for* Union, *r.* Uniſon. *p.* 16 *l.* 10 *r.* $666\frac{2}{3}$. *l.* 19 *r.* $888\frac{8}{9}$. *p.* 20 *l.* 9. *r.* a Semi-tone. *p.* 25. *l.* 2. *for* Sarts, *r.* Parts. *l.* 8. *for* Parts *r.* Part. *l.* 9. *for* 81 Part *r.* 81 Parts. *p.* 27 *l.* 17. *for* Exitance. *r.* Exiſtance. *p.* 28. *l.* 23. *for* of the Doctrine, *r.* if the Doctrine *p.* 37. *l.* 24, *for* will *r.* would. *l.* 26 *dele* or. *p.* 44 *l.* 17 *dele* In. *l.* 18 *for* is *r.* are. *p.* 48 *dele the three laſt Words.*

* * *

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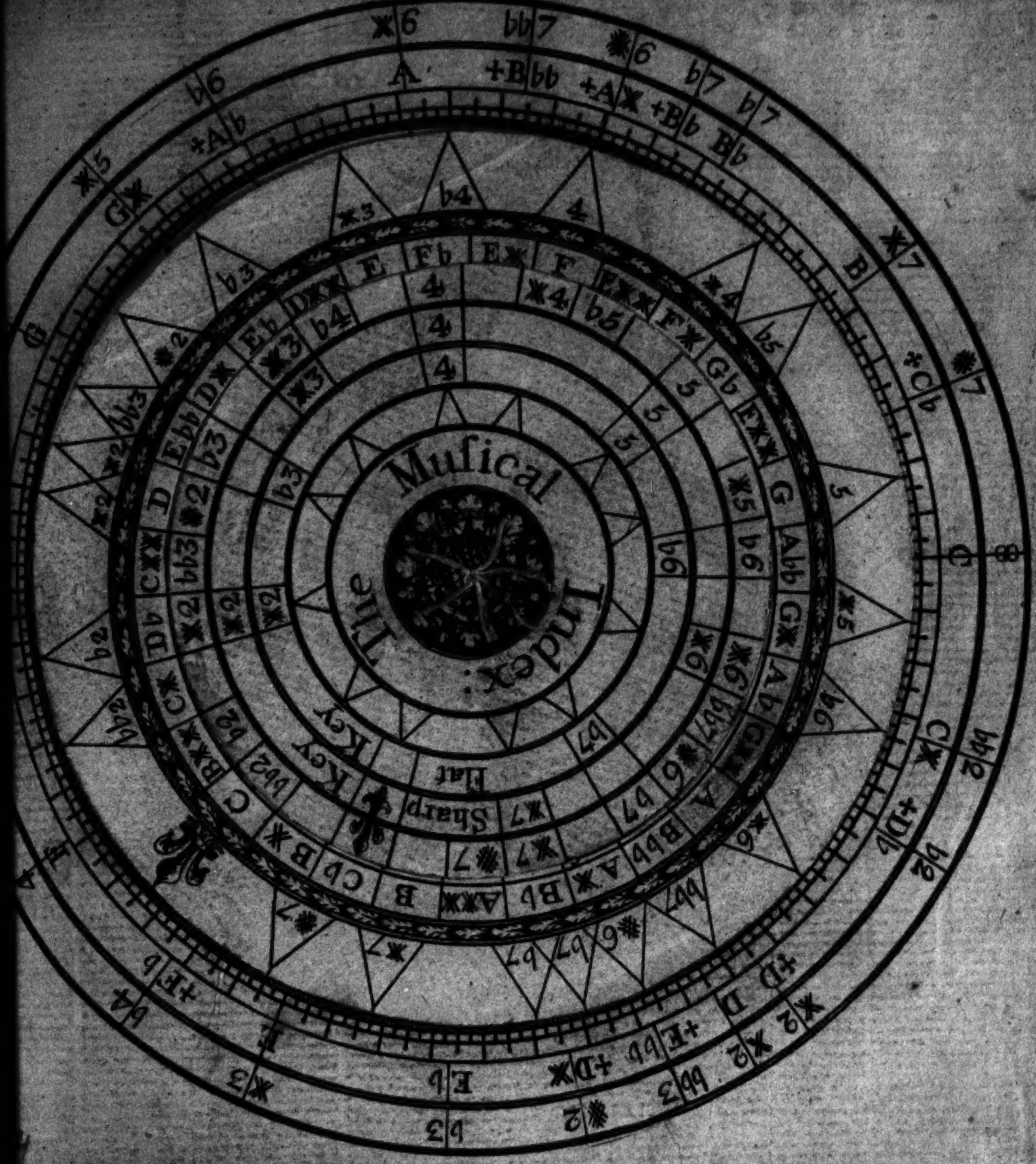
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